

Glottal efficiency



This program allows to evaluate the glottal efficiency, i.e. a ratio between the quantity of acoustic energy and the quantity of aerodynamic energy used for this production. These indexes explore the notion of vocal strain..

Principle

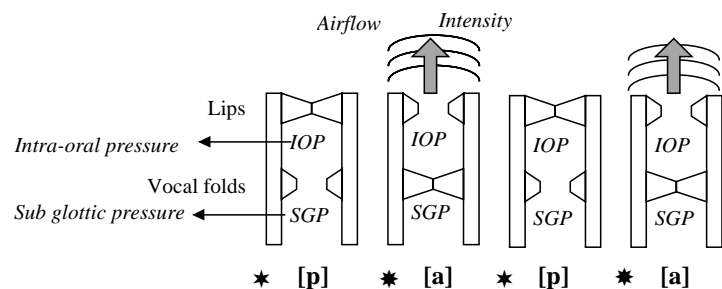
Smitheran et Hixon method : airway interrupted method.

Recording of the sentence « pa pa pa pa pa ... » with the intensity, intra-oral pressure, and oral airflow parameters.

① On the /p/, the lips are closed and the glottis is open. An equilibrium of pressures is established in the vocal tract. The sub-glottal pressure can be estimated by measuring the intra-oral pressure.

② During the /a/ production, the lips are open, which doesn't allow an interesting measure of the pressure. However, the recording of the acoustic intensity, and the oral airflow allows to obtain a combination of values which produce a notion of glottal efficiency.

The user places a cursor on a peak pressure (during the /p/ sustaining) and asks for an automatic adjustment of the analysis zones on intensity and airflow. Computations are made between theses values.



Preparation

Equipment

Place a disinfected mask on the mouthpiece. Choose a mask that will fit well with the patient face.

Do not stretch too much the mask to avoid splitting the synthetic material.

Place a disposable catheter on the left pressure plug of the mouthpiece.

Turn the selector **INPUT 1-LEFT** on **MASK**.

Software

Launch the SESANE software by clicking this icon in Windows task bar.



In SESANE, enter the patient information :



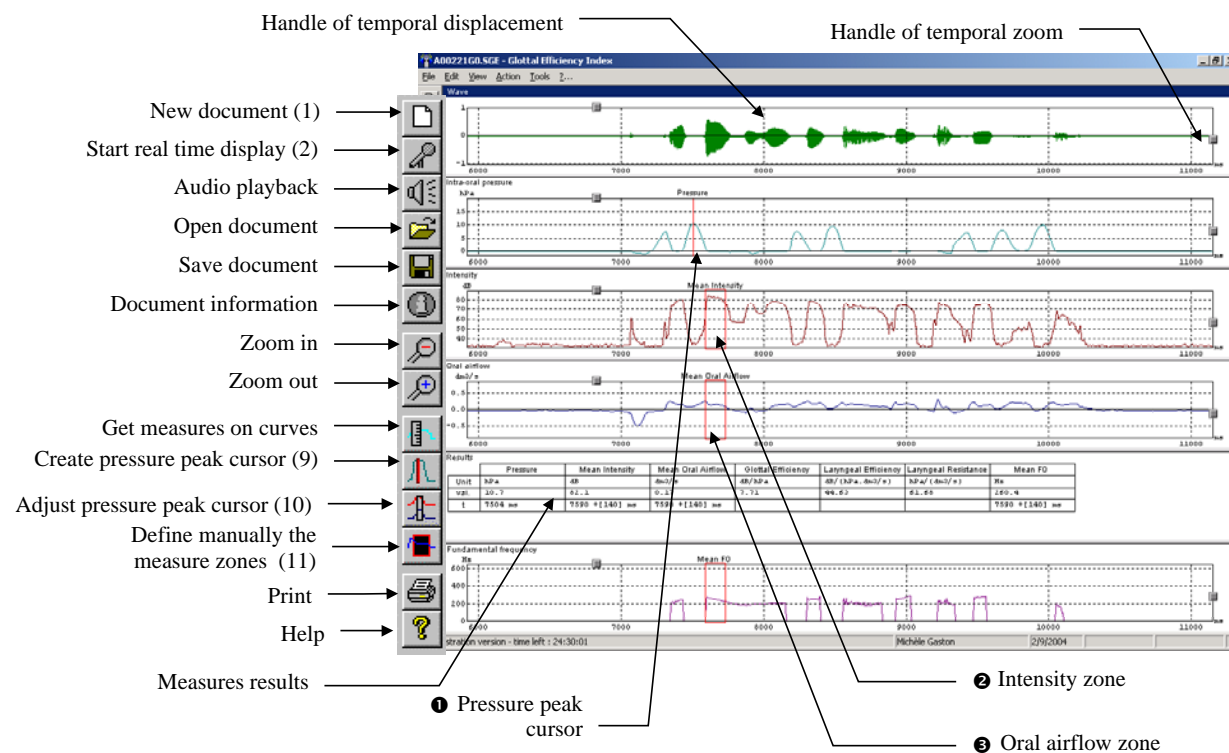
Patient Informations

Then double click on this icon :



Using Glottal Efficiency

Main window



User Interface is detailed in Chapter « References »

§ Menus & keyboard
§ Signal Manipulation

Protocol

(1) Create a new document

(2) Start real time display. *The record control window appears..*

Move away the patient from the mouthpiece.

(3) Calibrate the sensors, wait three seconds. *The airflow level must be at zero.*

Replace the patient in position.

Verify that the patient is correctly pressed against the mask, and check that the probe inside his mouth is not pinched by its teeth, nor obstructed by saliva.

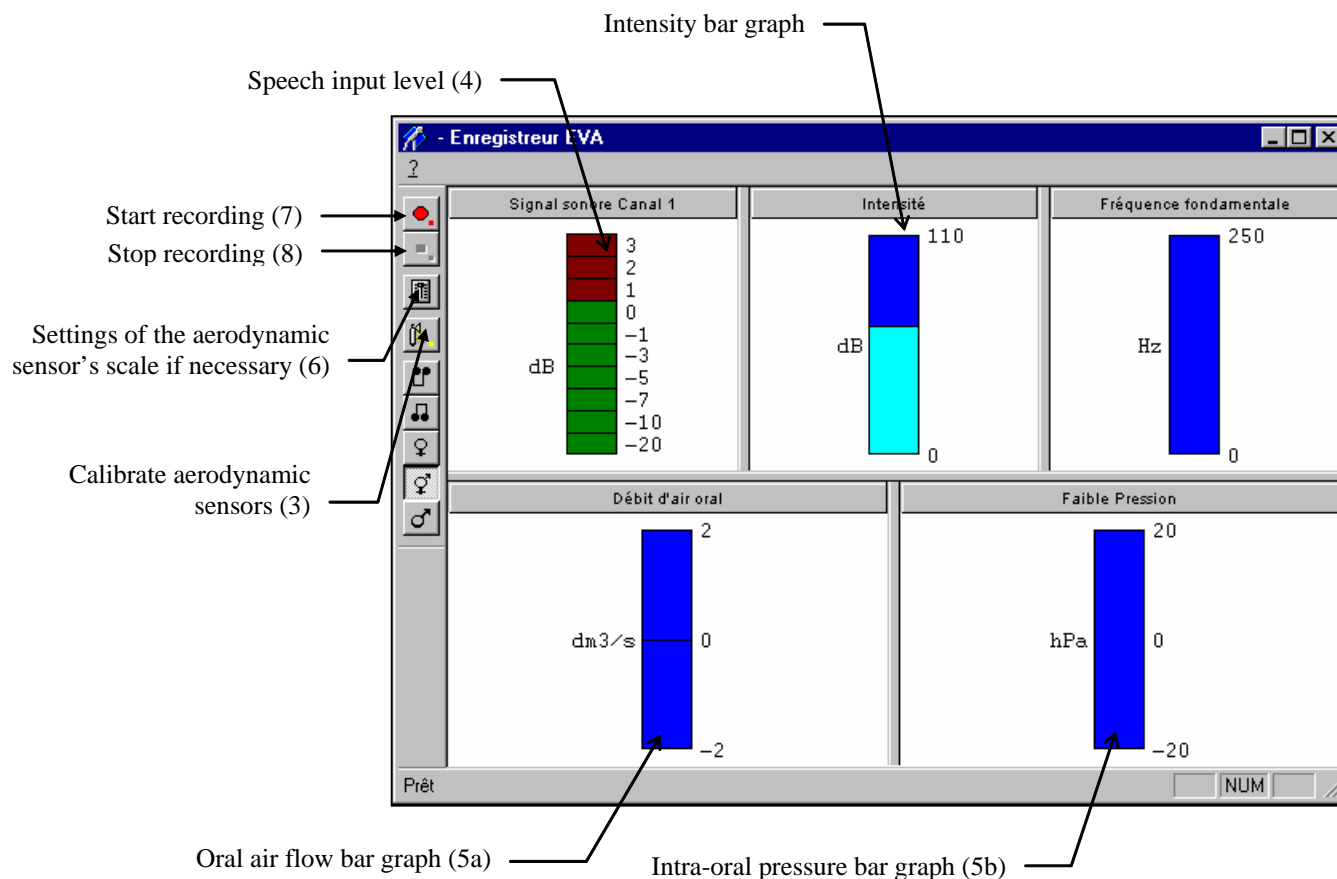
Make a test of « pa pa pa pa » at usual pitch and intensity.

(4) Verify the recording level of the acoustic input vu-meter. Beware of not reaching +3 dB while recording. If necessary, adjust the volume button of INPUT 1-LEFT. A low signal may indicate a bad position of the selector MASK - MICRO - LINE.

(5) Verify that the oral air flow and pressure input level does not saturate during phonation. *In this case, the bar graph color turns yellow.*



Record control window



(6) Verify that the intra-oral pressure input level does not saturate during phonation. *In this case, the color bar graph turns yellow*

(7) Start recording

The patient pronounce its « pa pa pa pa pa » serial.

(8) Stop recording. *The main window appears*

(9) Create the peak pressure cursor. *Automatic measures are proposed and the results are displayed in the array.*

To perform manual measures, move the peak pressure cursor. To do so, move the mouse pointer near it, click and hold down the left mouse button, then move the cursor near of a peak pressure. Adjust the measures (10). *The cursor is automatically placed at the exact top of the peak, and two analysis zones are created on the intensity and air flow signals. The results are displayed in the result chart.*

If the automatically detected computing zones are not well placed, change their location (grab the left side of the zone, and drag the mouse, maintaining its left button down). One can define manually the zones by selecting a part of signal (hold the shift key and the left mouse button while moving) then use the (11) command.

Save the document
Print the document.


Measurement

Measurements are performed using three cursors :

- ❶ a cursor which designates the peak pressure preceding the /p/ explosion
- ❷ a zone defining the intensity computed on the /a/
- ❸ a zone defining the oral airflow computed on the /a/


Cursors and Zone creation

The program creates automatically the cursor ❶ (peak pressure) at the maximal pressure value observable at screen. It places then the zones ❷ (intensity) and ❸ (oral airflow) on the /a/ following this peak pressure.

If the cursor ❶ (peak pressure) does not appear, use the icon  or select the menu « Action / New peak cursor » or use the keyboard shortcut « N »

Manual selection and automatic adjustment

It is possible to get measures on another peak than the automatically selected one. To perform manual measurement :

1. move the mouse pointer near the cursor ❶, click and hold down the left mouse button, then move it near another peak pressure
2. click on the  icon to adjust the ❷ and ❸ selection.
Or select the menu « Action / Addjust »
Or use the « A » keyboard shortcut

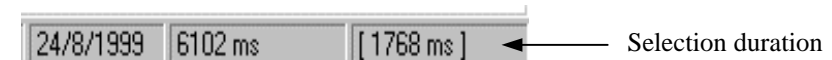
The cursor is placed exactly at the peak's top and two analysis zones are created on intensity and oral airflow curves. Results are displayed in the result chart.


Manual selection of the observation zones

If the automatically selected intensity and airflow zones do not seem to fit, you can move them (grab the left side of the zone, and drag the mouse, maintaining its left button down) One can define manually the observation zones ❷ et ❸. All the results will be computed again. To define manually an observation zone :

1. Create a selection zone (place the mouse cursor at the beginning, hold down the left mouse button, and the shift key at the same time, drag the mouse at the end of the selection, release)

You can control the selection duration by looking the program state bar :



2. click on the  icon
or select the menu « Action / Manual selection »
or use the « S » keyboard shortcut

The observation zone is resized to your selection and the statistics are computed immediately using these new data.

To define again automatically the observation zones :
select the menu « Action / Addjust »
or use the « A » keyboard shortcut

Indexes

Results are displayed in this chart :

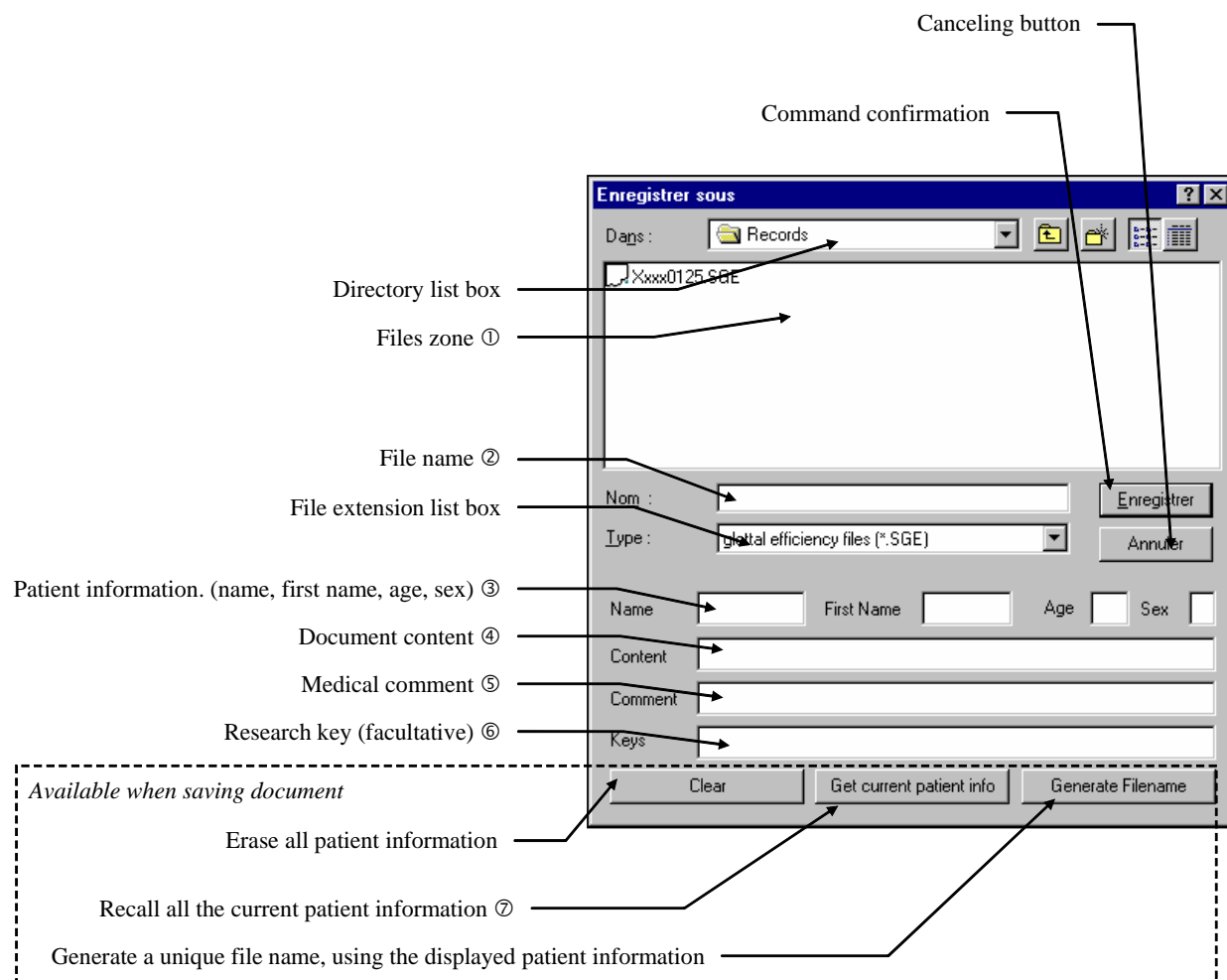
Measure type	→		Pressure	Mean Intensity	Mean Oral Airflow	Glottal Efficiency	Laryngeal Efficiency	Laryngeal Resistance
Measure unit	→	Unit	hPa	dB	dm ³ /s	dB/hPa	dB/(hPa . dm ³ /s)	hPa/(dm ³ /s)
Measure value	→	val.	14.9	71.0	0.04	4.76	109.89	343.73
Measure position	→	t	4223 ms	4310 +[120] ms	4310 +[120] ms			

Estimated sub-glottic pressure before /p/ explosion	↗	Pressure
Mean intensity on the following /a/	↗	Mean Intensity
Mean oral airflow on the following /a/	↗	Mean Oral Airflow
Intensity / Pressure	↗	Glottal Efficiency
Intensity / (Pressure x OAF)	↗	Laryngeal Efficiency
Pressure / OAF	↗	Laryngeal Resistance

Normality

Index	Normality boundary	Pathology increases when the index
Sub glottic pressure	7 hPa	↗
glottal efficiency	12,5 dB/hPa	↘
laryngeal efficiency		↘
laryngeal resistance	40 Pa/dm ³	↗

Data Management



Save a document

Method 1 : Click on ⑦. The current patient information appear in the fields ③, ④, ⑤, ⑥. A unique filename is automatically generated in ②. Confirm by clicking on ⑨.

Method 2 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Click on ⑧. A unique filename appears in ②. Confirm the saving by clicking on ⑨.

Method 3 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Enter a file name in ①. Confirm the saving by clicking on ⑨.



Open a document

Select a document in ① by a single click with the left mouse button.. The file name appears in ② with its information as well in ③, ④, ⑤ ⑥. Confirm your choice by clicking on ⑨.



To obtain information about the current document